Do openness paradoxes apply to Open Social Innovation?[1]

Alexandre Chloé
CIRAD
chloe.alexandre@cirad.fr

Ayerbe Cécile
Université Côte d'Azur, CNRS, GREDEG
cecile.ayerbe@univ-cotedazur.fr

Mignon Sophie
Université de Montpellier, laboratoire MRM, Montpellier
sophie.mignon@umontpellier.fr

Toillier Aurélie
CIRAD
aurelie.toillier@cirad.fr

Abstract: Open Innovation (OI) is presented as a necessity for meeting major societal challenges, such as managing epidemics, reducing poverty or combating climate. This has led to an increasing body of research named as "*Open Social Innovation*" (OSI). In this body, few scholars outline that OSI implies challenges and paradoxes, some of which are related to the well-known "*paradox of openness*". They suggest that the paradoxes inherent in OI may manifest themselves differently in open social innovation (Ahn et al., 2019; McGahan et al., 2021). However, this question has not been the subject of specific research. This article therefore seeks to explore the paradoxes of openness in OSI in order to gain a better understanding of the tensions that hinder social value creation and the ways in which organizations manage these tensions. We conducted a literature synthesis that we refined thanks to four case studies from the agricultural sector in the Global South. We present the specific characteristics of three paradoxes or pairs of tensions in OSI: knowledge sharing/protection; value creation/capture; accountability to donors vs. to beneficiaries. Finally, we specify the managerial implications of this study and suggest avenues for research to deepen the understanding of how social value is created and captured in OSI networks.

Key words: Open innovation paradoxes; Open social innovation; Knowledge sharing and protection; Value creation and capture; Digital innovation

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INTRODUCTION

A great achievement of the rich Open Innovation literature deals with the broadness of its scope. Initially focused on for-profit organizations, the studies have gradually expanded to encompass the practices of non-profit organizations and those seeking to create societal value. In the recent literature, OI is presented as a necessity for meeting major societal challenges, such as managing epidemics, reducing poverty or combating climate change (Ahn et al., 2019; McGahan et al., 2021). This has led to an increasing body of research named as "*Open Social Innovation*" (OSI). In their pioneering dedicated paper, Chesbrough and Di Minin qualify OSI as "*the application of either inbound or outbound open innovation strategies, along with innovations in the associated business model of the organization, to social challenges"* (Chesbrough & Di Minin, 2014, 270). While many elements of OI remain relevant, openness practices in OSI present some specificities that researchers and practitioners started to investigate. Among others, the epicenter of innovation shifts from a focal firm to a network of diverse organizations or institutions, including private firms but also NGOs, academia, public institutions and even the general public (Ahn et al., 2019). A consequence of stakeholder diversity is the tension between societal objectives and commercial viability (Fini et al., 2018).

This diversity, also implies challenges, several of which are related to the well-known "*paradox of openness*" (Bogers, 2011; Laursen & Salter, 2014). This paradox outlines that firms need to collaborate with various actors from outside their organization, but at the same time, need to take advantage of the returns from their innovations. Expanding this literature on the paradox of openness, few scholars suggest that organizations involved in OSI networks would not face

the same difficulties in acquiring new knowledge and would not be confronted with the same imperatives as private firms as regard to knowledge sharing (Ahn et al., 2019; Greco et al., 2022). They claim for a "*more in-depth understanding on how social value is identified, captured and realized*" in inter-organizational networks (Ahn et al., 2019, p. 271). In line with this emerging literature, this article aims to fill this gap by exploring the specificity of the paradoxes of openness in inter-organizational networks seeking to create societal value. More precisely, it intends at questioning the paradoxes described in OI in the light of empirical case studies of social innovation, in order to refine the paradoxes of openness in OSI. In other words, it addresses the following research question: what are the specificities of openness paradoxes in the context of social innovation?

Since little has been published on OSI paradoxes, we used an exploratory approach (Stebbins, 2001), consisting of in-depth, longitudinal, qualitative case studies. These cases were documented by Cirad (the French Agricultural Research Center for International Development[2]) in which one of the authors was involved during her PhD. Each case refers to an OSI process within an inter-organizational network that has enabled the development of a digital advisory service for smallholder farmers in the Global South. Such services aim to provide information and knowledge that will enable farmers to solve the problems they face on their farms, in particular to develop more environmentally friendly practices and to improve the living conditions of these small-scale producers. Examples of digital agro-advisory services include call centers, decision-support tools on smartphones, digital platforms and social networks (Steinke et al., 2017). The agricultural sector in the Global South is particularly well suited for the study of OSI processes, as it faces strong societal challenges (such as the production of healthy food, the health of ecosystems, adaptation to climate change, or poverty

[2] CIRAD means « Centre de coopération internationale en recherche agronomique pour le développement ».

reduction), and as innovation processes to address these challenges tend to involve a variety of actors, including non-profit and social organizations.

Based on these empirical investigations our paper contributes to the paradox of openness in the specific context of social innovation. It outlines that the traditional paradoxes occur. From that respect it sheds light on the tensions regarding knowledge sharing and protection which are not less accurate than supposed in existing research, outlining that OSI are not free of competition. It also emphasizes the inherent tensions between openness and closure which stems for the strong variety of actors. Moreover, our paper refines existing research by pointing out that the value creation / capture paradox has to be reconsidered in term of value co-creation (with intermediate and final results) and value sharing. Finally, it adds to the conversation by outlining a new paradox between achieving the objectives set by donors and serving the interests of project beneficiaries.

This article unfolds as follows. In the first section, we present our literature review dedicated to OI paradoxes and assumptions about the potential specificities of these paradoxes in OSI (1). The second section is dedicated to the methodology (2). In a third section, we present the results on the nature of OSI paradoxes based on the analysis of the four case studies (3). In a final section, we discuss the limitations and contributions of this study (4).

1. THE SPECIFICITIES OF OPEN SOCIAL INNOVATION PARADOXES?

This first section is dedicated to the investigation of the so-called "*OI paradoxes*". In line with Laursen & Salter (2014) pioneering paper, several scholars have paid attention to the tensions that stems from openness (1.1). Although the question of the nature of paradoxes in OSI has not been the subject of specific research, we outline how the tensions inherent in OI manifest themselves differently in this body of research (1.2). Based on this literature review, we propose a framework to guide the analysis of the nature of openness paradoxes in OSI (1.3).

1.1. THE OPEN INNOVATION PARADOXES

OI offers numerous opportunities for organizations or networks of organizations, including access to more advanced knowledge, increased organizational learning capacity, better returns on investment, and the production of more relevant goods and services thanks to the integration of user inputs (Ahn et al., 2019). However, these organizations or networks have to cope with a number of tensions to realize these opportunities. Three main openness paradoxes have been identified in the dedicated literature, namely the tension between openness and closure; the tension between knowledge sharing and knowledge protection; and the tension between value creation and value capture. The first one is the most well-known and has been the most investigated. The other two stemmed from that one. Overall, these paradoxes are not disconnected from each other, but rather constitute different lenses through which to analyze the tensions inherent in OI.

- **Openness/closure**

The main idea behind the OI paradigm lies in the purposive inflows and outflows of knowledge through a firm's boundaries which become porous. The pooling of knowledge is the very essence of openness but it poses new challenges in terms of controlling this openness. A tension appears indeed between the need to open up innovation to integrate new knowledge from outside or make it available to others; and the need to control and maintain boundaries(Enkel et al., 2009; Gandia & Parmentier, 2020; Gassmann & Enkel, 2004). This tension openness/closure has been the subject of various debates. An innovation process is generally considered open when two organizations or more exchange knowledge across their boundaries. However, this vision of openness does not fully consider the degree of control that organizations retain over the knowledge and resources they share. Chesbrough's initial definition of openness may thus appear limited, insofar as certain players may be excluded

from accessing knowledge (Pénin, 2013; Pénin & Wack, 2008). Therefore, several scholars propose to distinguish "controlled" OI (characterized by the freedom to exchange knowledge but also to exclude players from using it) from "libre" OI (characterized by the freedom to access and use knowledge) (Wikhamn, 2013).

- **Knowledge sharing/protection**

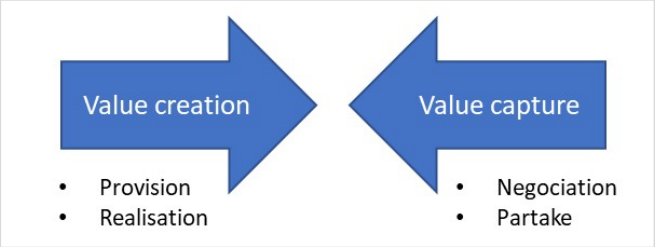
The paradox between knowledge sharing and protection is probably the most well-known tension when discussing the paradoxes of openness (Laursen & Salter, 2014). Engaging with a broad set of external actors in an innovation process indeed implies risks of appropriation that players must manage. Studies on open innovation have therefore explored the relationship between appropriability and openness, which do not appear to be contradictory, but rather work hand in hand. Studies on OI have shown that this tension can be overcome by developing intellectual property rights (IPR) strategies of varying degrees of complexity (Bogers, 2011). Several factors are now known to influence factors the extent to and mode in which knowledge is shared and protected in OI processes. A central factor refers to knowledge characteristics and properties (including its degree of tacitness, codifiability, newness or specificity) and how it is embodied (i.e., in IPR, technology, people, routines). Several studies revealed indeed that knowledge exchange strategies tend to be more open in collaborations where tacit knowledge prevails (Bogers, 2011). Another factor refers to the partnership characteristics, including trust and commitment, as well as the degree of geographical, cultural and technological distances between partners. The OI literature explore how such relational elements might hamper or facilitate knowledge sharing. Among others, the seminal work of Bogers (2011) on this topic highlighted the ambivalence of distance between partners: while geographical and cultural distance tend to increase the complexity of knowledge sharing, these differences between partners can also enhance the appeal of collaboration, perceived as more interesting and stimulating. Finally, environmental dimensions (including the type of actors involve in the

partnership or specificities of the sector considered) also influence the way organizations cope with this tension. For example, the prevalence of process technologies or services in certain sectors might result in difficulties to use patents as protection (Alexiev et al., 2015; Chesbrough, 2011).

- **Value creation/capture**

The value creation/capture is also intrinsically linked to openness: value creation in OI requires organizations to open up in order to leverage external knowledge, while value capture calls for a tighter, more protective process (Chesbrough et al., 2018). Drawing on the strategy and marketing literature, the concept of value in OI has been clarified by distinguishing two perspectives: value-in-use (i.e., value derived from the production of a new product or services through the consumption of resources) and value-in-exchange (i.e., value encapsulated in the exchanged resources, defined by actors' perception of the resources' potential usefulness for addressing their needs). This distinction resulted in the identification of four processes constitutive of the OI capability (see Fig. 1).

Figure 1: representation of the value creation/capture paradox. Authors, inspired by Chesbrough et al. 2018



To achieve value creation, an organization must be able to provide resources to others (*value provision process*) and to use resources to realize its own value (*value realization process*). To achieve value capture, an organization requires to negotiate appropriate returns (*value negotiation process*) and partake in later value creation by partners (*value partake process*)

(ibid.). Yet, more studies are needed to understand value is created and distributed, especially in multi-actor open innovation.

1.2. ASSUMPTIONS ON POTENTIAL PARADOXES OF OPEN SOCIAL INNOVATION

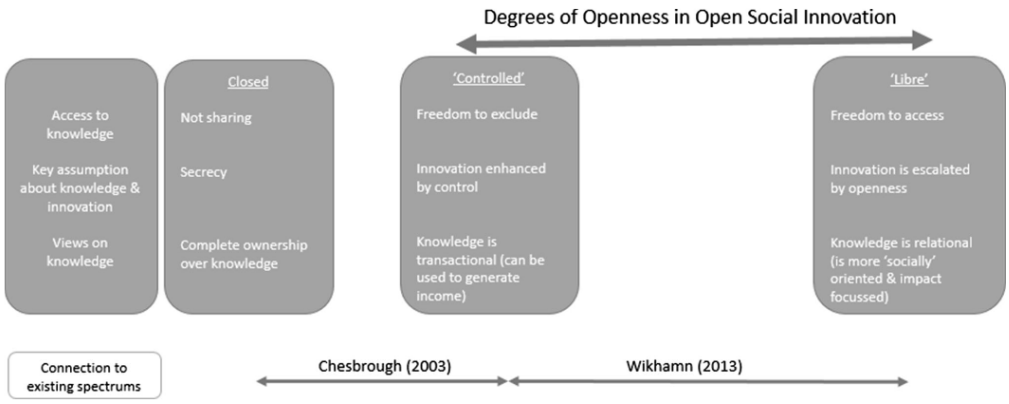
Although the question of the paradoxes in OSI has not been the subject of specific research, several studies have put forward assumptions, supporting the idea that the tensions inherent in OI manifest themselves differently in these OSI processes. We present the main ones below, using the pairs of tensions outlined in the section above.

- **Openness/closure**

Existing studies suggest that innovation processes seeking to create societal value might be more open than conventional OI processes, involving mostly for-profit organizations driven by profitability constraints. The more complex the societal challenges to be tackled, the more diverse and numerous the organizations involved in OSI processes.

In terms of access to and use of knowledge, OSI processes would also be more open. However, the analysis of social enterprise openness strategies highlights that these organizations can mobilize hybrid openness strategies. They highlight the existence of a spectrum of openness within social contexts, ranging from controlled to libre open innovation (see Fig. 2) (Tuckerman et al., 2022). It thus appears that OSI claims for multiple and complex openness strategies, which still have to be investigated, in particular in third sector organizations.

Figure 2: Spectrum of openness in Open Social Innovation. Source: Tuckerman et al., 2022.



- **Knowledge sharing/protection**

With regard to knowledge sharing and protection issues, a first input from the existing literature refers to the OI dynamics observed. While outside-in dynamics are dominant for profit-oriented firms (Chesbrough, 2012; Chesbrough & Brunswicker, 2014), inside-out or coupled processes (Piller & West, 2014) are expected to prevail when stakeholders are driven by societal value creation (Ahn et al., 2019). However, the knowledge flows still remain unexplored in the OSI literature. In particular, the coupled process, which seems to be particularly relevant for social innovations, should be better investigated (Santoro, Gabriele et al., 2018). A second academic input deals with the very nature of OSI which should lower the tensions regarding knowledge sharing and protection. Several studies suggest that tensions over access to knowledge, and the need to compensate external partners by providing reciprocal benefits, may be less acute in OSI processes. Indeed, sharing information and knowledge is part of the core mission of non-profit organizations such as governments, academia and NGOs. This enables partnering organizations to harness new knowledge resources shared by voluntary participants at a lower cost (Ahn et al., 2019).This awareness has enabled connections to be established between actors that are not often present in conventional OI partnerships, such as retired experts, graduate students or the general public (Wang et al., 2011). Because of less (or the absence of) commercial viability constraints, competition within OSI processes would also be lower. This

collaborative atmosphere in OSI is thus expected to reduce the risk of knowledge leakage and the need to resort to complex intellectual property strategies as commonly used in conventional OI processes (Ahn et al., 2019). However, OSI processes are not completely exempt from knowledge protection issues, as demonstrated by the existence of hybrid openness strategies (Tuckerman et al., 2022). The analysis of the practices of contributors to crowdsourcing platforms put forward a variety of informal mechanisms implemented at the individual level for protecting knowledge, including selective revealing, solution black-boxing, controlling complementary assets, and intermediary bypassing (Foege et al., 2019). Overall, it is likely that knowledge exchanges in OSI operate within processes that are more emergent and less organized than the well-planned R&D collaborations of conventional OI (Kania et al., 2014).

- **Value creation/capture**

Because of the inherent nature of social innovation, the tensions between value creation and value capture in OSI processes would be more acute than in OI.

Value creation would indeed be hampered by the diversity of stakeholders. In OI processes involving essentially for-profit firms, value creation is facilitated by the fact that stakeholders share the same organizational culture and that activities are primarily guided by a profit creation objective (Kotlar et al., 2018). Conversely, in OSI processes, the various stakeholders may be guided by different objectives and definitions of what they consider to be of value – be it social, economic or environmental value (Adams et al., 2016). This divergence of motivations can result in a new type of paradox, namely the tension between, on the one hand, objectives of altruism (or the creation of societal value); and, on the other, objectives of commercial viability (or the creation of economic value) (Fini et al., 2018). A major challenge is therefore to succeed in aligning these different expectations so as to create shared value (Pfitzer et al., 2013; Porter & Kramer, 2011).

Value capture is also a key issue in OSI processes. As pointed out by Ahn et al. (2019, 272), *"the challenge herein is the set-up of a governance model that not only manages joint value creation but also ensures fair value capturing by all partners involved. Particularly in projects that aim to create societal value, the adequate measurement of the value created and the effective distribution of value captured among OI partners can be a strenuous task*". Measuring the non-pecuniary value generated by partnerships for the various players involved (e.g., in terms of knowledge generated, gain in legitimacy or reputation, new network established) constitute indeed a considerable challenge, especially as what's of value is specific to each stakeholder. A key point is therefore to strike a balance between the mutual interests of the participants.

1.3. ANALYTICAL FRAMEWORK

Based on this literature review, we designed a framework (see Table 1 above) to guide the analysis of openness paradoxes in OSI processes, and their specificity or similarity to OI processes. This framework will help us to address our research question: what are the specificities of openness paradoxes in the context of social innovation?

Table 1: Analytical framework on OI paradoxes and their potential specificity in OSI processes. Authors.

OI paradoxes	Definition and elements of analysis considered	Assumptions regarding differences of paradoxes in OSI
Openness / closure *Enkel et al., 2009; Gassmann & Enkel, 2004; Gandia & Parmentier, 2020*	- Refers to the degree of openness and management of boundaries - Openness assessed by the number of actors or the freedom to access to knowledge *(Pénin, 2013*) (controlled vs libre OI - *Wikhamn et al., 2013)*	- More diversified players (and potentially more numerous if societal challenges are complex) *(Ahn et al., 2019)* - Libre OI more widespread than controlled OI - but existence of hybrid strategies *(Wikhamn et al., 2013)*
Knowledge sharing / protection *Bogers, 2011; Laursen and Salter, 2014*	- Refers to tensions in information and knowledge sharing and relates to appropriability issues - Tension influenced by several factors including knowledge characteristics & embodiment, relational elements (e.g. trust), partnership characteristics, environmental dimensions (e.g., sectoral specificities) - Tension commonly managed through IPR	*Might be less pregnant in OSI* - Outbound/coupled dynamics are more common *(Ahn et al., 2019)* - Easier access to knowledge at a lower cost - Less competition between partners and reduced risk of knowledge leakage *(Ahn et al., 2019; Wang et al., 2011)* - Use of IPR less common / not necessary – but use of hybrid strategies and informal mechanisms to protect knowledge *(Foege et al.., 2019)* - More 'emergent' processes; not framed by 'well-planned R&D alliances' *(Kania et al., 2014).*

Value creation / capture
Chesbrough et al,. 2018
	- Refers to stakes of valorization and profitability
	- 4 processes and associated capabilities (*Chesbrough et al., 2018)*
	  ○ Value provision and value realization (to create value)
	  ○ Value negotiation and value partake (to capture value)
		Might be more acute in OSI
		- Value creation complicated by diversity of objectives, operating methods and what they consider value-bearing (econ, social, env.) -> altruism/profitability tension *(Fini et al., 2018)*
		- Value capture more complex due to difficulties in measuring the different types of value generated by the partnership, including non-pecuniary values *(Ahn et al., 2019)* + issues of fair value distribution among partners

2. METHODOLOGY

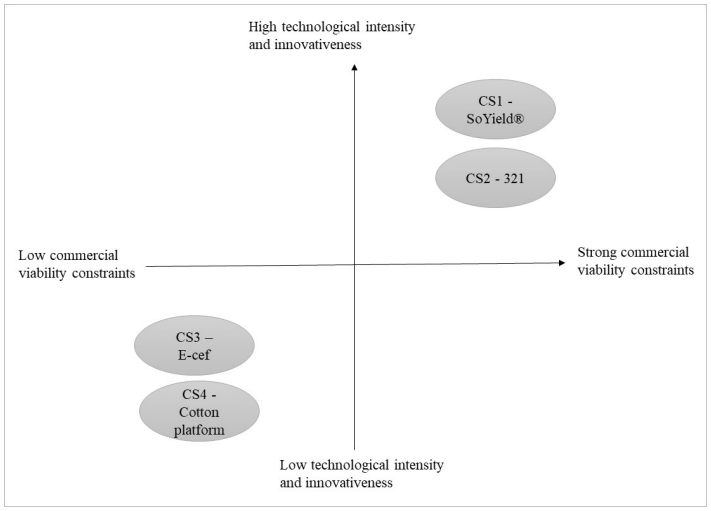
2.1. SELECTION AND DESCRIPTION OF CASE STUDIES

A qualitative exploratory approach (Stebbins, 2001) was used in this study as there is limited evidence of openness paradoxes in social context. Four in-depth longitudinal case studies were undertaken to illuminate OSI paradoxes (Creswell & Poth, 2017). The four OSI cases were either implemented by Cirad researchers in collaboration with its partners, or analyzed by Cirad researchers, subsequently to the development of digital advisory services. Cirad is a publicly funded AR4D organization with 1700 employees working in partnership with scientists, private firms, public institutions, farmers and civil society in the Global South. Cirad's motto explicitly puts research for development at the center, as "*contributing to sustainable development of rural areas and agricultural supply chains in Southern countries, with particular emphasis on fairness and on the world's poorest populations*" (Cirad DG-DRS 2012). Its research interventions thus aim to support the achievement of the Sustainable Development Goals for and through sustainable agriculture (Blundo Canto et al., 2018). To this end, Cirad activities are based on a systemic and interactive vision of innovation. Innovation is seen as a collective process of knowledge and technology exchange and co-creation between stakeholders interacting at different levels within Agricultural Innovation Systems (AIS) (Hall et al., 2006; Klerkx et al., 2012; TAP, 2016). As a result of this dual "research" and "international development" component, Cirad researchers are called upon to perform a variety of functions, ranging from participating in the development of solutions (co-design of technologies e.g.), to facilitating or coordinating innovation processes, and analyzing these processes and evaluating their effects and impacts (Toillier et al., 2018). Interventions involving Cirad researchers, or analyzed by them, are particularly relevant for questioning how joint social value is realized. the diverse nature of these stakeholders and the complexity of the issues addressed pose

challenges that have prompted Cirad to reflect on how to best support and accelerate open social innovation (Toillier et al., 2018).

We have selected the case of digital farm advisory services because the "technological" component facilitates comparison with work on the paradoxes of conventional OI, which has been developed mainly in the high-tech sector. The case studies were chosen according to a replication logic (Eisenhardt, 1989 ; Yin, 2018). They have to be "*a selection of an appropriate population*" and "*may be chosen to fill theoretical categories and provide examples of polar types*" (Eisenhardt, ibid, 537). In line with Eisenhardt's statement, all the cases we selected involved various partners who are engage a service innovation. From that respect they are relevant to investigate the tensions that we have outlined in our framework. But in line with (Flyvbjerg, 2011) we intended to give variation across two dimensions : (i) the prevalence of commercial viability constraints for the partnership players; and (ii) the degree of innovativeness and technological intensity of the digital service developed (see Fig. 3 below). In accordance with the theoretical sampling logic, these two criteria were chosen for their likely influence on the knowledge sharing /protection practices which is particularly related to the openness / closure and value creation / capture tensions. Strong commercial viability constraints (generated by the central position of for-profit organizations in the network) are likely to generate stronger knowledge protection, through formal mechanisms. The degree of innovativeness of the digital service (new to the world or new to the country (Garcia & Calantone, 2002) and its technological intensity should influence the type of knowledge protection mechanisms. As indicated by Eisenhardt (1989, 537), in this theoretical sampling logic, "*multiple cases within each category allowed findings to be replicated within categories*". The cases can be polar types in order to outline contrasting situations. This is exactly the choice we made by choosing 2 cases according to the following quadrant:

Figure 3: Variability across OSI case studies. Authors.



- **Case study 1 (CS1): The SoYield® decision support system**

SoYield® is a decision support system which provides high accuracy yield predictions to mango small-scale producers and other value chain actors in West Africa (mainly Senegal and Ivory Coast), through a multilingual mobile app designed for low-cost smartphones and low-connectivity environments. The decision support system is being developed by a start-up and research centers (French, Senegalese and Ivorian), using a user-centered approach relying on frequent interactions with farmers. The prevalence of commercial viability constraints is high. The decision support system relies on innovative visual recognition and artificial intelligence techniques, and is therefore characterized by a high degree of innovativeness.

- **Case study 2 (CS2): The 321 interactive voice server**

Launched in 2017 in Burkina Faso, the 3-2-1 interactive voice server (IVS) provides voice messages (in French and three local languages) promoting 'good agricultural practices' for six crops, and providing weather forecasts. It is offered by the Orange Burkina Faso company, but was developed in collaboration with a social enterprise, international NGOs, the state of Burkina Faso and producers' organizations. The prevalence of commercial viability constraints is high and technological intensity of the service moderate (new to the country).

- **Case study 3 (CS3): The E-Cef digital platform**

Developed in 2019 in Burkina Faso, the E-cef digital platform aims to facilitate the collection and sharing of the technical and economic data needed for management advice to family farms (MAFF). The MAFF method aims to strengthen farmers' ability to manage their farms and improve their autonomy with regard to their social and economic environment. It is based on participatory approaches relying on (i) reflexive analyses to identify, and sometimes modify farmers' and advisers' representations of the problems addressed, and (ii) decision-support tools based on technical and economic data to produce new knowledge. The results collected are first analyzed by each farmer with the support of an advisor, then discussed collectively in farmers groups. This platform was developed as part of a partnership between a network of producer organizations and a technological start-up, facilitated by an international organization (the FAO). The prevalence of commercial viability constraints is moderate as the platform was funded by an international development project. As similar digital platforms exist in Burkina Faso, the degree of technological intensity of the digital service is also low.

- **Case study 4 (CS4): The digital platform for organic cotton production**

Developed from 2015, this digital platform is managed by the national union of cotton producers in Burkina Faso (later in text Cotton farmer organization) and has been developed with three main actors: the farmer organization, an international NGO and an international tech company. This digital platform enables the farmer organization's advisors to monitor the practices of organic cotton producers and advise them on how to meet the requirements of the organic and fair-trade specifications. As in the case of CS3, the prevalence of commercial viability constraints and the degree of technological intensity of the digital service are low. However, CS3 and CS4 differ in the type of actors involved: CS3 has the particularity of

involving an international organization, acting as a facilitator between farmers' organizations and their partners.

2.2. DATA COLLECTION AND ANALYSIS

One of the authors spent one year and a half in Burkina Faso. This long period allowed a rich data collection, several contacts with the actors and made it easier to understand the context of the various cases. Data were collected through 70 qualitative semi-directive interviews. We also added secondary data, such as meeting minutes or annual reports documenting the progress of the innovation process, relations between partners (including potential tensions) or decisions taken concerning knowledge sharing and protection, or value capture. For each case study, we interviewed members of the major organizations involved in the partnership, taking care to meet managers, technicians and engineers involved in the development of the service, and employees from legal departments when they existed (Table 2).

Table 2: Information about the data collection process. Authors.

Case study	***Period of engagement***	***Profile of interviewees and number of interviews (70) conducted***	***Nature of secondary data***
CS1 SoYield®	January 2022-February 2023	- **Research center** (5 employees, including 1 researcher in digital agriculture, 1 researcher in agronomy, 1 researcher in deep learning, 1 employee from legal support services and 1 Ph.D. candidate in the agrophysiology) - **Start-up** (5 interviewees, including the CEO, the CTO, the product owner, the product manager, and the R&D lead) - 2 **farmers** who tested the prototypes	Meeting minutes Individual briefs on the progress of the collaboration
CS 2 321	April 2018 to December 2019	- **Telecommunication operator** (3 managers; 1 engineer) - **Social enterprise** (3 managers) - **NGO 1** (1 manager, 2 technicians) - **NGO 2** (1 manager, 1 technician) - **Ministry of Agriculture** (1 agent)	Annual reports Communication leaflets
CS 3 E-cef	April 2018 to December 2019	- **Farmer organization leaders** (13 representatives) - **International organization** (1 project manager; 2 facilitators) - **Start-up** (1 manager, 2 engineers)	Project reports Meeting minutes
CS 4 – Cotton platform	April 2018 to December 2019	- **Farmer organization** (23 interviewees, including 3 representatives, 10 technicians, 10 advisors) - **NGO** (2 local technicians and 1 international manager)	Meeting minutes Activity reports

An interview guide was developed based on the analytical framework presented in Table 1 above (see point 1.3). We used topic and analytical coding techniques (Richards, 2015) to analyze primary and secondary data.

3. EXPLORATION OF OPEN SOCIAL INNOVATION PARADOXES IN THE AGRICULTURAL SECTOR IN THE GLOBAL SOUTH

In this section we present the results of this research. The objective is to outline the specificities of the openness paradoxes in the investigated cases. Because of these specificities, the three tensions that we outlined in the literature review were not relevant to structure this section. In other terms, the qualitative approach invites us to flexibility of the framework in order to really catch paradoxes in a social context. We first wanted to outline the strong collaboration between various actors which is characteristic of the studied cases (3.1). This led us to highlight the tensions related to value creation and sharing among these actors (3.2) and the mechanisms that have been developed for knowledge protection (3.3).

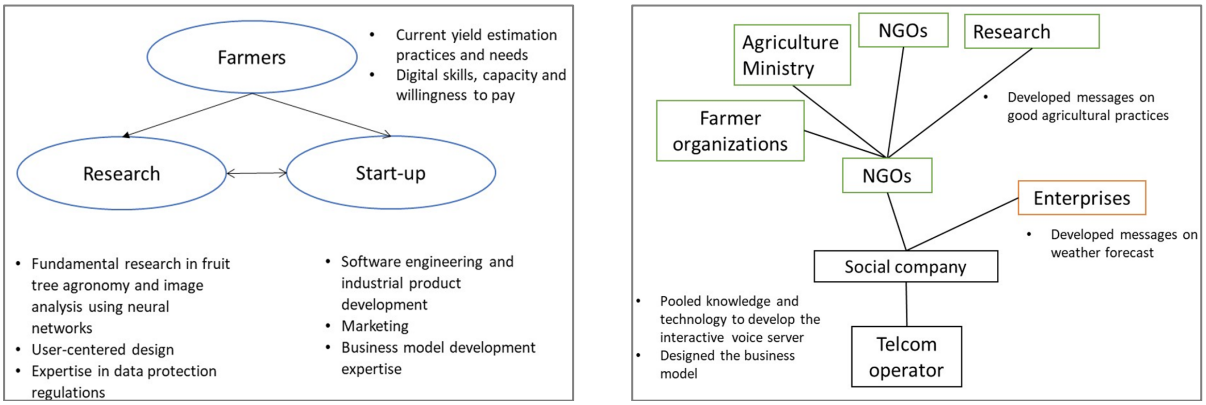
3.1. COUPLED INNOVATION WITHIN NETWORKS CHARACTERIZED BY A STRONG DIVERSITY OF ACTORS

The investigated OSI cases rely on coupled or co-creation dynamics, where the various partners share knowledge, but also ideas, skills and technologies to achieve a common innovation project. This strong collaboration among numerous and various actors is a source of tensions regarding value creation and sharing (see 3.2).

In CS1 (SoYield®), the digital decision support tool was developed thanks to the shared knowledge and skills of three types of players (see left side of Figure 4): research centers (from the Global North and Global South), sharing their knowledge and skills in fundamental research in agronomy and in image analysis using neural networks; a start-up, contributing its skills in software engineering and product development; and farmers, involved in a user-

centered design approach that helped identify users initial needs and guide choices in terms of the mobile application's functionality and ergonomics. The partnership between the research center and the start-up was developed within the framework of an R&D alliance, supported by several projects financed by various donors (research ministries and regions).

Figure 4: Knowledge and resource exchanges between partners in CS1 SoYield® (left) and CS2 321 (right). Authors.



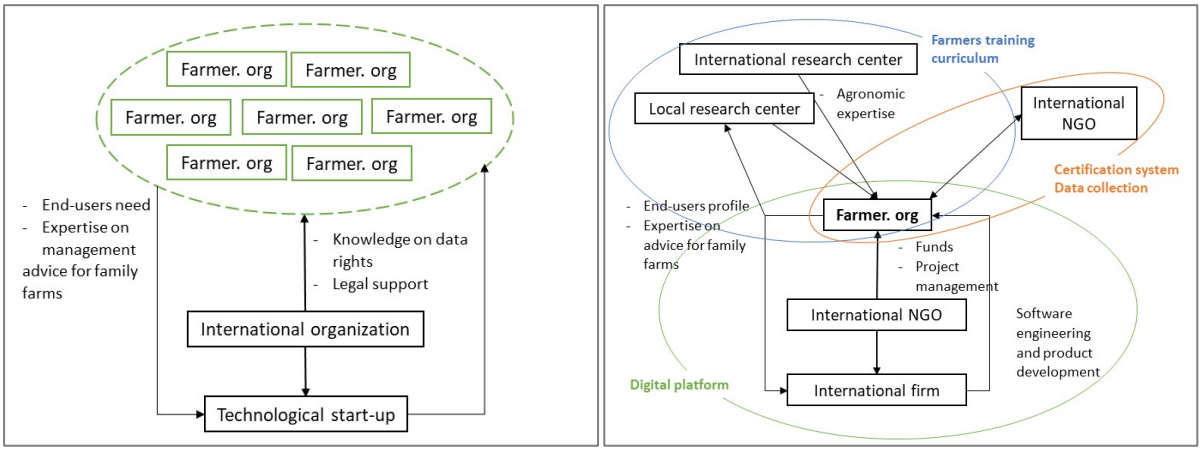
In CS2 (321), the IVS providing advice on best agricultural practices was developed by mobilizing the resources, knowledge and skills of more than a dozen organizations (see right side of Figure 4). The telecom operator and the social enterprise acting as network hub developed the technology for recording and broadcasting voice messages to farmers. These messages on good agricultural practices were developed by NGO companies in collaboration with Burkina Faso's government advisory services, the national agricultural research institute and a network of producer organizations, although this collaboration was not formalized in a partnership agreement. The climatic information disseminated by the IVS, on the other hand, has been developed by companies, dealing directly with the network's pivotal social enterprise.

In CS3 (E-cef), the digital platform for management advice for family farms (see left side of Figure 5) was developed by a network of 7 farmer organizations and a local technology start-up, with the intermediation of an international organization that funded this 4-year project (2015-2019). The network of farmer organizations contributed their in-depth knowledge of

users and expertise in advisory services, while the start-up contributed its experience in software engineering and product development. The international organization facilitated communication between the two organizations and provided legal support for the drafting of the contract defining the commitments of each actor.

In CS 4 (Cotton platform), the digital platform for organic and fair-trade cotton certification and extension to farmer organizations (see right side of Figure 5) was developed as part of a three-year international development project involving a farmer organization, an international NGO, and an international firm (see green circle). Prior to this collaboration, the farmer organization also collaborated with local and international research centers, which mobilized their agronomic expertise to design the farmer training curriculum (see blue circle). The farmer organization also collaborated with an international NGO to set up the cotton certification system and design the data collection forms (see orange circle).

Figure 5: Knowledge and resource exchanges between partners in CS3 E-cef (left) and CS4 Cotton platform (right). Authors.



3.2. CHALLENGES REGARDING VALUE CREATION AND SHARING

The above outlined diversity of actors highlights tensions related to value creation and sharing. They also illustrate the formal or informal mechanisms used to avoid the emergence of these tensions and to manage them (see Table 3 for a summary of the 4 case studies).

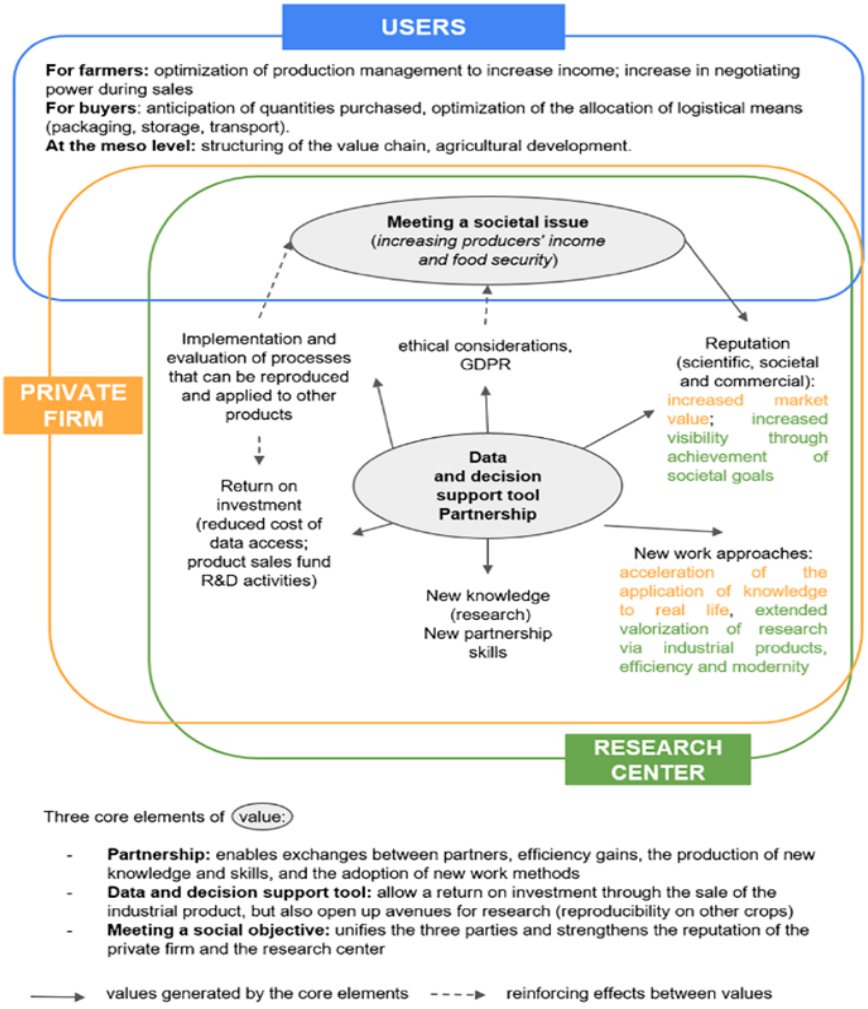
- **CS 1 SoYield ®**

As OSI processes tend to involve a variety of different organizations, creating shared value depends on the ability to adjust to and compromise with the operating mode of each partner. These differences can be felt, for example, in the pace of work and the speed of decision-making, as illustrated by the SoYield® case study. In this case study, agronomic research activities carried out by one of the partners were conducted over long cycles (several growing seasons, over several years), while the decision support tool market for the private partner faced various market opportunities per year, which is a fast time step in comparison with research activities. Responding to user needs also required to act rapidly, as farmers use the digital application on a season-to-season basis, while needing to adapt to rapid environmental and economic changes. Thus, a certain amount of flexibility was required to fill the time gap between the expectations of applied research, the private sector and users. One solution identified was to anticipate as best as possible the research activities to be performed, keeping in mind that these differences in development cycles may open opportunities towards the complementarity of R&D activities.

CS1 SoYield® also illustrates challenges that can raise due to the tension between social value creation and profitability and the associated ethical concerns. The SoYield® DSS is a fruit production data management tool. The mobile application enables mango growers to obtain an early estimate of the yield of mango trees in their orchards. Mango production data (type of fruit, location and available quantity) and farmers' data are then centralized, anonymized and aggregated by the research center and start-up that co-own the application. As small-scale mango growers in Africa have a very limited capacity to pay for the service, one of the challenges for the partners was to find a viable business model that did not disadvantage growers. To this end, the partners chose to establish a freemium business model where

smallholder farmers could use the digital application for free, while the premium component was designed for other value chain actors (agribusinesses, exporters, governments, non-governmental organizations but also financial institutions), willing to pay to access consolidated data on farmers and mango production. However, this last point raised concerns among some members of the research center, who feared that the transmission of information on farmers' yields to financial institutions could have a negative impact on the ability of some farmers to obtain loans. In order to facilitate the creation of shared value, partners used a combination of informal and formal mechanisms. First, they held a workshop at the start of the collaboration to clarify the expected objectives of each partner and to present their mutual operating styles and practices. This workshop helped to clarify the rules of collaboration and create mutual understanding between the different partners. This workshop and the subsequent discussions also helped to define the values to be produced during the collaboration and their interest for each partner, as illustrated by Figure 6. In summary, the research center was primarily interested in valorizing its own knowledge and sourcing data to produce science and impacts, and in perceiving returns on investment to amortize its initial R&D financial efforts.

Figure 6: Core elements of value for the three mains actor types in the SoYield® case study. Source: Alexandre et al., 2023



The private firm focused mainly on the adoption and/or expansion rate of the product, its profitability, and impacts. Finally, end-users were more interested in the actual service provided by the solution, its reliability, and its costs (cost/benefits approach). However, all partners agreed that the SoYield® DSS must contribute to achieving positive societal impacts, in this case, structuring the mango value chains in Africa to the benefit of local stakeholders and increasing farmers' income. This exercise constituted a crucial step in determining the compatibility of each participant's expectations, and therefore the validity of the choice of partner. It also helped build trust within the partnership. Another crucial element in building

trust between partners was the establishment of a contract to clarify the issues concerning the sharing of intellectual properties, of added-values, and of the products developed (mainly models and technologies). As developers and potential beneficiaries were very different in nature and in economic size (e.g., companies vs. farmers, agribusiness farmers vs. smallholders), special attention was given to avoid an asymmetrical technological and economic valorization of the invested knowledge. Establishing such a contract was perceived by partners as a necessary tool to avoid misunderstandings before they arise, to safeguard each partners' interests and to formalize reciprocal commitments. The exercise conducted previously to determine the values of interest for each partner and the common objectives made it possible to negotiate this contract with greater flexibility, keeping in mind the priority objective of creating societal value. The contract also specified the use of farmers personal data and played an important role during the DSS research and development phase. It also helped designing the business model and the DSS terms of services.

- **CS2 321**

The CS2 321 illustrates how tensions between the objectives of commercial profitability and those of creating societal well-being can jeopardize the partnership. The objectives and constraints specific to the company and to an NGO involved in the development of the IVS came into conflict when elements of the initial business model were renegotiated. While the private company needed to reduce the number of messages farmers could listen to free of charge on the IVS in order to meet its costs, this ran counter to the NGO partner's objective of providing a free service accessible to as many farmers as possible. The NGO therefore reconsidered its commitment to the partnership.

In contrast to CS1, this tension did not manifest itself at the beginning of the partnership, but rather at the time of profit sharing due to the change in the business model. This unforeseen

change undermined trust between the partners. In order to limit this tension, the hub of the network (a firm) considered changing partners and working not with an NGO but with a social enterprise that had more similar constraints.

- **CS 3 – E-CEF**

CS3 "E-CEF" illustrates how the creation of social value also depends on the ability of partners to bridge gaps within the partnership, particularly in terms of technological capabilities. The network of seven farmer organizations had very limited ICT skills and technological capabilities, which made it difficult to interact with the start-up working with them to develop the digital platform. The farmer organizations were also at a disadvantage in the contract negotiations due to their limited knowledge of data ownership and use issues. Conversely, the startup, whose employees were all based in the city, found it difficult to visualize the farmers' needs for this advisory platform. To overcome this distance between the partners, three actions were taken. First, the collaboration was facilitated by a third-party organization that was familiar with the constraints of the other two partners to facilitate communication. In addition, a study visit of several weeks was organized with the end-users of this digital advisory platform in order to better understand the farmers' needs and the functioning of the advisory service. Finally, the international organization, acting as a facilitator, trained the network of farmer organizations on data ownership issues.

- **CS 4 – Cotton platform**

CS 4 illustrates the tensions that can arise between the need to retain control of the innovation process and the need to open up, at the risk of losing influence over the definition of problems and solutions. It also highlights another type of tension, namely between the need to satisfy the interests of the stakeholders and beneficiaries of international development projects, and the

need to achieve the objectives set by the projects' donors. Indeed, disagreements emerged between the two main stakeholders (NGO and farmer organization), who had contrasting visions of the functions that the digital platform should fulfill as a priority. The farmer organization wanted the digital platform to be used first and foremost to collect information on the problems encountered by farmers and their practices, so that this information could be processed and then shared with farmers to help them improve their practices. Over the course of the project, the NGO ultimately preferred to mobilize this digital platform for two other functions: to facilitate the monitoring of organic and fair-trade cotton production in order to facilitate its certification; and to monitor the progress of the international development project funding the major part of the advisory system. This shift in the platform's functions can be explained by the fact that the farmer organization was not included in the discussions with the company that created the digital platform. This international company, based in the Global North, was chosen by the NGO. The technicians at the producer organization did not feel competent to discuss the technical aspects of the digital platform, especially in English. They therefore entrusted these tasks to the NGO, whose decisions resulted in the development of a platform whose functionalities were ultimately more conducive to monitoring (as wished by the NGO) than to advice (as wished by the farmer organization). The NGO explains its decision not to include the farmer organization in discussions with the developer, and then in the management of the platform, by the need to be efficient in order to meet the timetable initially set as part of the short-term international development project. In this case study, the partners failed to put in place mechanisms to manage these tensions. In this sense, this case represents a "semi-success": a digital platform was developed, but it did not meet the initial expectations of the farmer organization. Nevertheless, the collaboration enabled its members to identify gaps in their skills and knowledge (particularly around data ownership) that need to be strengthened before embarking on a new partnership.

All the tensions outlined in these cases are summarized in the following table.

Table 3: Tensions regarding value creation/sharing and coping mechanisms. Authors

Case studies	Tensions value creation/sharing	Mechanisms for avoiding or managing tension
CS1 SoYield ®	Organizational distance (different work pace) Altruism/profitability tension -> definition of an "ethical" business model	Freemium" business model Informal and informal mechanisms to build trust 1/ Workshop to clarify objectives, constraints, ways of working -> definition of collaboration rules; builds mutual understanding 2/ Reflection on "value elements" -> to assess the compatibility of expectations and validity of partner choice 3/ Defining a contract to avoid misunderstandings, safeguard interests and formalize mutual commitments
CS2 321	Altruism/profitability tension	Questions the sustainability of the partnership Network hub considers changing partner profile (social enterprise rather than NGO)
CS3 E cef	Cognitive and technological distance	Third-party facilitation User study visit Capacity building
CS4 Cotton Platform	Diverging expectations Tension accountability to donor vs to beneficiaries	A case of semi-success Partners identified gaps in knowledge and skills

3.3. A SPECTRUM OF KNOWLEDGE PROTECTION MECHANISMS WITH VARYING DEGREES OF FORMALIZATION

The readiness of the organizations involved in the OSI processes studied to share resources and knowledge in order to bring a joint innovation project to fruition does not mean that the issues of knowledge protection (and more generally of value capture) commonly observed in OI are absent. In all four cases studied, organizations are confronted with the need to obtain a return on their investment in the innovation process. Nevertheless, it is interesting to note that knowledge protection is not based on patenting, as is common for OI projects in the technology sector, but rather on a variety of more or less formalized mechanisms.

In CS3 (E-CEF platform), the organizations involved also invested their resources and knowledge in developing services of Management Advice to Family Farms (MAFF), relying on specific methods and tools. These organizations began to reflect on potential ways of valorizing this investment, and of preventing the tools and methods from being appropriated by others, with the risk of diverting the original MAFF approach. The solution envisaged was therefore to create a label to define the specific features of the MAFF approach and control its use.

CS4 (Cotton farmer organization platform) illustrates a situation where aspects of knowledge protection and value capture were not sufficiently discussed by the partners, leading to tensions at the end of the project. Over the course of a 3-year development project, the two main partners (farmer organization and NGO) invested their knowledge and skills in the development of the cotton farmer organization's digital advisory platform. This background knowledge was not protected. In exchange for its investment and participation in the innovation process, the cotton farmer organization expected to be able to access and use the digital platform and the data collected. However, this aspect was not covered by a legally binding contract. The farmer organization was therefore only able to access the digital platform and use the data produced at the end of the project, when the project ended and the NGO stopped the collaboration. This situation can in part be explained by the farmer organization's limited knowledge of its data rights, including rights of access, control and ownership of data, as well as obligations relating to the informed consent of data producers.

In these two case studies, the innovation process was framed by international development projects involving non-profit or socially-oriented organizations (left-hand side of figure 3). These organizations did not seek to protect their background knowledge through IPRs. This

can be explained in part by the collaborative logic guiding the innovation process, but also by the fact that this knowledge was embodied in people (and not technologies or processes), which can make it more complicated to protect through formal mechanisms. Yet, such knowledge is essential to the innovation process, as in the case of knowledge and ideas provided by users (current or potential), enabling the development of relevant and personalized goods and services.

In the two other case studies, the innovation process was primarily driven by profit-driven organizations, although they also sought societal value (see right-hand side of figure 5).

In CS1 (SoYield®), featuring a higher degree of technological innovation, a contract between the main partners (research center and start-up) was also used to clarify the sharing of intellectual properties, added-values, and the products developed (mainly models and technologies). The background knowledge in visual recognition processes and data analysis models invested by the research center was also protected by the registration of a trademark.

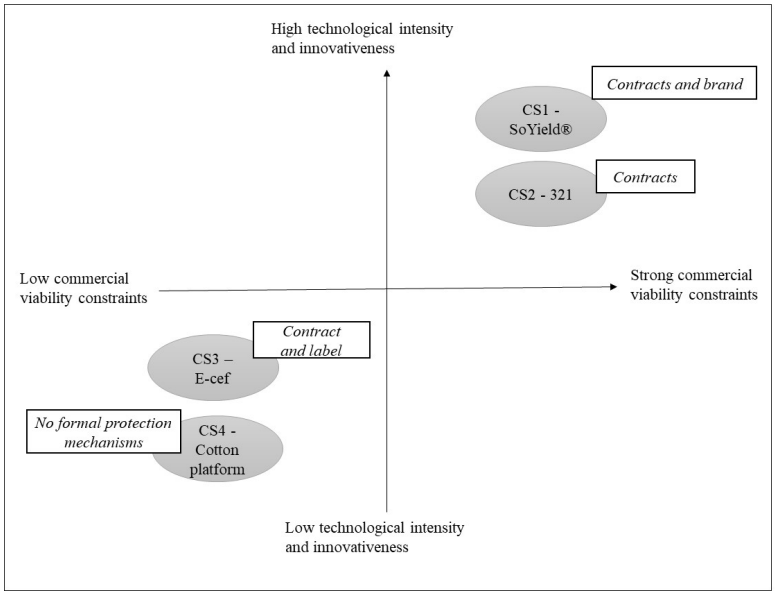
In CS2 2 (321), the two hub organizations (i.e., the telecommunications company and the social enterprise) each provided part of the technology and infrastructure required to operate the interactive voice server. The investment of each partner, the property rights to the service developed and the distribution of added-value were specified in a binding contract.

As illustrated in Figure 7, we thus observe a gradient with regard to the protection of shared knowledge and the formalization of associated mechanisms (absence of protection, label, binding contracts, brand). Based on these case studies, this diversity appears to be influenced by three elements:

- the nature of the knowledge shared and the way in which it is embodied (knowledge embodied in technology may be easier to protect than that embodied in people)

- the degree of innovativeness of the technology (patents cannot protect less innovative technologies)
- the prevalence of profitability constraints (leading to more formalized and binding protection mechanisms)

Figure 7: A gradient of knowledge protection and of use of formalized valorization mechanisms. Authors.



4. DISCUSSION AND CONCLUSION

Confronting the assumptions formulated in the literature with the four case studies, this paper provides new insights into openness paradoxes in OSI. By identifying the tensions and mechanisms for managing them, it contributes to the understanding of how social value is created and shared in inter-organizational networks practicing OI. We discuss these contributions to openness paradoxes in OSI (4.1) and present the study's limitations and avenues for future research (4.2). Finally, we provide recommendations for practitioners seeking to sustain social value through openness (4.3).

4.1. INSIGHTS ON TENSIONS AND PARADOXES OF OSI

Returning to the assumptions on the openness paradoxes in OSI, we find that most of the potential tensions from the literature occur in the cases studied. However, our research outlines new contributions and nuances on main points, as summarized in Table 4 above and discussed afterwards.

Table 4: Main contributions of the study

OI paradoxes	Assumptions regarding differences of paradoxes in OSI	Contributions of the study
Openness / closure *Enkel et al. 2009 ; Gassmann & Enkel, 2004 ; Gandia & Parmentier, 2020*	- More diversified players (and potentially more numerous if societal challenges are complex) *(Ahn et al, 2019)* - Libre OI more widespread than controlled OI - but existence of hybrid strategies *(Wikhamn et al. 2013)*	✓ ✓
Knowledge sharing / protection *Bogers, 2011; Laursen and Salter, 2014*	*Might be less pregnant in OSI* - Outbound/coupled dynamics are more common *(Ahn et al, 2019)* - Easier access to knowledge at a lower cost - Less competition between partners and reduced risk of knowledge leakage *(Ahn et al, 2019 ; Wang et al. 2011)* - Use of IPR less common / not necessary – but use of hybrid strategies and informal mechanisms to protect knowledge *(Foege et al., 2019)* - More 'emergent' processes; not framed by 'well-planned R&D alliances' (Kania et al., 2014).	✓ ✗ - Tension between sharing and protecting knowledge are not necessarily less acute - OSI processes are not free of competition ✓ ✓
Value creation / capture *Chesbrough et al. 2018*	*Might be more acute in OSI* - Value creation complicated by diversity of objectives, operating methods and what they consider value-bearing (econ, social, env.) -> altruism/profitability tension *(Fini et al., 2018)* - Value capture more complex due to difficulties in measuring the different types of value generated by the partnership, including non-pecuniary values *(Ahn et al, 2019)* + issues of fair value distribution among partners	✓ - The "value creation/sharing" lens seems more appropriate for exploring openness tensions in OSI but calls for a reconceptualization.- OSI processes are not free of competition - Additional tension between accountability to donors and consideration of beneficiaries' expectations

- **Confrontation to the assumptions from the OSI literature**

With regard to the degree of network openness, the case studies illustrate the diversity of the organizations involved and of the resources shared or co-produced within the network of actors, including technologies, but also knowledge (explicit or tacit) and ideas. These actors deeply differ in status (firm, NGO, public administration, international organization, farmer organization) and organizational culture. These networks are characterized by a strong technological distance and a wide range of expertise, as well as a strong geographical and cultural distance. These diversity and distance, while essential to the success of the innovation project, do generate managerial tensions that can hamper the co-creation of value.

This article also helps to nuance the assumptions that the knowledge sharing/protection paradox is less acute in partnerships aimed at creating societal value (Ahn et al., 2019). While all stakeholders in the cases studied were willing to share their resources and knowledge, this did not exclude the emergence of tensions concerning the protection of knowledge. On this latter point, a gradient of situations can be observed, ranging from an absence of knowledge protection, to more formalized mechanisms such as the creation of labels or the registration of trademarks. This absence of knowledge protection mechanisms can be explained by the collaborative logic in which the partners are involved. But, as the CS4 (Cotton platform) illustrates, it may also be explained by a lack of legal skills and knowledge of how to enforce property rights, particularly on the technologies and data produced.

The exploratory work we carried out suggests that the mechanisms to protect knowledge and distribute value is influenced by three other factors (the type of knowledge and its embodiment, the degree of innovativeness of technologies; and the degree of prevalence of commercial profitability constraints). In line with Bogers (2011), future research could seek to analyze how these different factors interact and influence openness paradoxes in OSI.

Our findings are also in accordance with studies assuming that the value creation/capture tension is present in OSI partnerships, or even more pronounced due to the diversity of stakeholders' objectives, organizational cultures, knowledge and resources. In CS1 and CS2, guided by for-profit organizations, a tension between societal value creation and commercial viability emerged when negotiating the business model for the new service created, confirming the existence of the tension altruism/profitability mentioned in the OSI literature.

- **Towards a refinement of the value creation/capture paradox in OSI**

The cases studied suggest above all that the paradoxes of OI in a social context are best read through the prism of value creation/capture, rather than that of knowledge sharing/protection.

Indeed, the organizations concerned may wish to share knowledge without fear of it being appropriated and used by others, but only on condition that they derive benefits (pecuniary or non-pecuniary) from this innovation process; in other words, that they succeed in capturing part of the value created.

However, the cases studied call for a reconceptualization of the value creation/capture paradox, as the two faces and four value processes (*provision, realization, negotiation partake*) may not be sufficient to account for the specificities of OSI and facilitate these processes.

Instead of value capture, it seems more appropriate to talk about sharing. Our findings suggest that this value sharing needs to be discussed by all stakeholders from the very start of the partnership. Moreover, these discussions should not focus solely on the value created at the end of the innovation process (the innovative services and technologies and the profits generated by their sale), but also on the value elements created during the partnership, also qualified as "*intermediate results of value co-creation*" (Boldrini, 2018). As illustrated by CS1 SoYield®, these intermediate results include the data produced by the digital services, but also the skills developed, the knowledge acquired and/or co-produced, the reputation effects, the development of a network and the identification of new opportunities (see Figure 8). The identification of these results (intermediate and final results of value co-creation) by the partners makes it possible to clarify the interests of each stakeholder, and to facilitate negotiations for a sharing of value deemed satisfactory to all. These practices and tools developed for valuation can also be considered as an intermediary result (Bertheau & Garel, 2015). Researchers also defend the view that the identification of knowledge or skill gap (for example digital skills or knowledge about data rights as in CS4) also constitutes an intermediary result (Elmquist & Le Masson, 2009).

Furthermore, this study calls for a reconsideration of the relationship between these 2 faces (creation/capture or co-creation/sharing), which appear more complementary than paradoxical. In CS1 (SoYield®), the contract established to define value sharing between the various partners was seen as a cornerstone of the partnership, strengthening trust between the organizations and thus fostering value creation despite the organizations' differing objectives and operating methods. In this sense, value creation and value capture do not stand in opposition to each other, but rather follow a continuum: clearly defining the elements of value and the rules for value sharing is a precondition for creating shared value.

- **Highlighting the paradox of accountability to donors vs to beneficiaries**

Finally, this study reveals the existence of a paradox that is rarely mentioned in the literature on OSI, namely the paradox between achieving the objectives set by donors and serving the interests of project beneficiaries. Generally guided by a mission of public service, donors operating in the Global South are strongly concerned by the social, economic and environmental aspects of the international development projects they fund. For the organizations that receive these funds and implement these projects, this commitment manifests itself in the need to demonstrate how the activities envisioned by the projects will contribute to the targeted societal impacts. This planning of activities mainly relies on the elaboration of a logical framework, a results-based management method, enabling the articulation between project objectives, expected results, planned activities, hypotheses/risks, resources to be mobilized, and indicators to assess the project's progress (Ika & Hodgson, 2014).

While this method facilitates project accountability to donors, it also imposes strong constraints that shape innovation processes (Giovalucchi & Sardan, 2009). This logical framework is usually designed in advance of projects and usually involves only key partners. Planned activities are rarely adaptable during the course of the project, even though innovation

processes involve a degree of unpredictability that requires a certain degree of adaptability. Moreover, this method prioritizes the evaluation of project activities according to a predetermined schedule set at the beginning of the project. This obligation to achieve results in a short time sometimes works to the detriment of partnership relations and the quality of the services developed, as illustrated by CS4 (Cotton platform). These constraints are exacerbated by the fact that development projects tend to operate over a relatively short timeframe (3 or 4 years), which is not always conducive to complex innovation processes.

The literature on innovation in the agricultural sector in the South suggests ways to overcome these tensions. To mitigate the short timeframe of development projects, it may be advisable to design and implement the innovation process through several successive projects or "*project clusters*" (Temple, 2017). In addition, advocacy with donors could be undertaken to ensure that these projects are evaluated not only in terms of the realization of activities and the production of final value results (e.g., innovative goods and services), but also in terms of intermediate value result, such as the establishment of quality partnership relationships or the strengthening of certain skills and knowledge (Alexandre et al., 2022).

4.2. LIMITS OF THE STUDY AND AVENUES FOR RESEARCH

As mentioned in the introduction, there is still little work exploring the paradoxes of openness in OSI, especially in the agricultural sector and in the context of developing countries. In this sense, this article lays the foundations for an enrichment of the theory of OI, which can be considered as a middle-range theory (Loilier & Tellier, 2011; Sanchez & Heene, 2010) displaying organizational, sectoral and contextual specificities that should be investigated (see Table 5). Indeed, a middle theory is indeed based on the assumption that, in specific contexts, different cause-effect relationships are obtained, mobilizing different types of variables.

Table 5: the opposition between grand theory and middle-range theory. Authors, based on Loillier and Tellier (2011) and (Boudon, 1991)

Comparison variables	Grand theory	Middle-range theory
Objective of the theory	Identical: identification of variables (internal and external to organizations) that determine the success of innovation processes and value creation.	
Field of validity of the theory	Total: regardless of the context studied	Partial: in certain types of contexts
Philosophical assumptions regarding the theory's construction	The world studied is consistent and systematic in terms of causality and behavior	The world is inhomogeneous and subject to variability in terms of causality and behavior

In the case studied, further research would therefore be needed to analyze whether the specific features of the openness paradoxes observed are inherent to all OSI settings, or whether some are specific to the agricultural sector, or to countries of the Global South. To this end, one avenue for future research would be to explore the complementarity of the literature on OSI, where case studies on innovation in the context of Southern countries remain rare(Chesbrough & Di Minin, 2014; Tabaklar et al., 2021) and the literature on the accompaniment and facilitation of agricultural innovation processes in the Global South (Faure et al., 2018; Toillier et al., 2016, 2018). The latter body of literature could indeed contribute to a more thorough understanding of the challenges emerging from collaborative innovation processes and potential solutions to address them.

4.3. MANAGERIAL IMPLICATIONS

The case studies highlight several practices that facilitate the creation of societal value within networks of organizations. We therefore recommend that practitioners wishing to create social value in a multi-actor network consider the following:

- From the very beginning of the collaboration, initiate a reflexive process to identify and define the potential intermediate and final results of the co-creation (whether pecuniary or not) and how they may or may not overlap for the different partners.

- Seek to clarify the constraints and operating modes of each stakeholder, in order to define rules of collaboration that suit every partners. This practice provides a cornerstone for the collaboration, by confirming the choice of compatible partners and by reinforcing mutual understanding and trust.
- Develop a contract early on in the partnership to clarify intellectual property rights and value sharing in order to reinforce trust and prevent conflicts from arising. Defining such a contract also provides an opportunity to reflect on the ethical issues raised by the innovation process (e.g., regarding the use of sensitive or personal data) and to guide activities to protect the interests of both participants and users of the innovation.
- When partners in the OSI process share ideas, resources or knowledge that cannot easily be protected through IPRs, a collective discussion should be held about the compensation (financial or otherwise) to be provided.
- Do not consider negotiations about value sharing as an obstacle to collaboration, but rather as a precondition for value co-creation.

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